Prevention Program

- Safety information
- Process hazard analysis
- Operating procedures
- Training (operators)
- Mechanical integrity
- Management of change (MOC)
- Pre-startup safety review
- Compliance audits
- Incident investigation

Process Safety Information

- **Material Safety Data Sheets (MSDS) that meet the requirements of the OSHA Hazard Communication Standard [29 CFR 1910.1200(g)]? [68.48(a)(1)]**
- **Toxicity information? [68.65(b)(1)]**
- **Permissible exposure limits? [68.65(b)(2)]**
- **Physical data? [68.65(b)(3)]**
- **Reactivity data? [68.65(b)(4)]**
- **Corrosivity data? [68.65(b)(5)]**
- **Thermal and chemical stability data? [68.65(b)(6)]**
- **Hazardous effects of inadvertent mixing of materials that could foreseeably occur? [68.65(b)(7)]**

MSDS Anhydrous Ammonia

Airgas

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SECTION 1: CHEMICAL PRODUCT & COMPANY IDENTIFICATION

CHEMICAL NAME: Anhydrous Ammonia
TRADE NAMES / SYNONYMS: Ammonia

DISTRIBUTOR:
Airgas Specialty Products
6340 Sugarloaf Parkway, 300
Duluth, GA 30097 USA

EMERGENCY TELEPHONE NUMBERS:
Transportation (CHEMTREC): 1-800-424-9300
Transportation, Canada (CANUTEC): 1-800-528-4963
Environmental/Health/Safety (24-hr): 1-800-528-4963
Customer Service (Toll Free): 1-877-395-2225

SECTION 2: COMPOSITION / INFORMATION ON INGREDIENTS

CHEMICAL	FORMULA	% BY WEIGHT C-grade	% BY WEIGHT P-grade	CAS	OSHA PEL	NIOSH REL / ACGIH TLV		IDLH
					25 ppm (California only)			
Ammonia	NH_3	99.5	99.995	7664-41-7	50 ppm (TWA)	25 ppm (TWA)	35 ppm (STEL)	300ppm
Water	H_2O	0.4	33 ppm	7732-18-5	None	None	None	
Oil	--	0.1	2 ppm	———	None	None	None	

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: 1. Colorless gas or compressed liquid with a pungent, suffocating odor 2. Liquid ammonia reacts violently with water. Vapor cloud is produced. 3. Avoid contact with liquid and vapor. 4. Stay upwind and use water spray to absorb vapor. 5. Not flammable under conditions likely to be encountered outdoors. 6. Stop discharge if possible.

POTENTIAL HEALTH EFFECT

ROUTES OF ENTRY: Inhalation, Skin Contact, Eye Contact, Ingestion TARGET ORGANS: Eyes, skin and respiratory system.
EYE CONTACT: Exposure to liquid or high concentrations of vapor can cause painful, instant and possibly irreversible damage to tissue such as conjunctiva, cornea and lens. SKIN CONTACT: Prolonged contact with high concentrations can cause painful tissue damage, frostbite and serious chemical burns. INHALATION: Depending on exposure concentration and duration, effects can vary from none or only mild irritation, to obstruction of breathing from laryngeal and bronchial spasm, to edema and severe damage to mucous membranes of the respiratory tract with possible fatal results. Latent edema and residual reduction in pulmonary function may occur. INGESTION: Tissue damage, chemical burns, nausea and vomiting can occur. Ammonia is a gas under normal atmospheric conditions and ingestion is unlikely. CARCINOGENICITY: NTP? No IARC? No OSHA? No

SECTION 4: FIRST AID MEASURES

EYE CONTACT: Flush with large amounts of water for at least 15 minutes then immediately seek medical aid.
SKIN CONTACT: Immediately flush with large quantities of water for at least 15 minutes while removing clothing. If clothing has frozen to skin, thaw with water before removal. Seek immediate medical aid.
INHALATION: Remove from exposure. If breathing has stopped or is difficult, administer artificial respiration or oxygen as needed. Seek immediate medical aid.
INGESTION: Do not induce vomiting. Have victim drink large quantities of water if conscious. Immediately seek medical aid. Never give anything by mouth to an unconscious person.

SECTION 5: FIRE FIGHTING MEASURES

FLASH POINT(method used): Not Applicable FLAMMABLE LIMITS: 15-28% in air (for labeling purposes, not DOT flammable gas). EXTINGUISHING MEDIA: With a source of ignition, ammonia will burn in the range of 15-28% in air. Stop flow of gas or liquid.
SPECIAL FIRE FIGHTING PROCEDURES: Move containers from fire zone if possible; if not, use water to cool fire-exposed containers. Use water spray to control vapors. Do not put water directly on liquid ammonia. Personnel must be equipped with appropriate protective clothing and respiratory protection.
NFPA HAZARD CLASSIFICATION: Health: 3 Flammability: 1 Reactivity: 0 (least-0—4-highest)

SECTION 6: ACCIDENTAL RELEASE MEASURES

In US, release of 100 lb. or more of ammonia must be reported immediately to the National Response Center at (800) 424-8802, the SERC and the LEPC. SUGGESTED LOCAL ACTION: Stop leak if feasible. Avoid breathing ammonia. Evacuate personnel not equipped with protective clothing and equipment. Use copious amounts of water spray or fog to absorb ammonia vapor. DO NOT put water on liquid ammonia. Contain run-off to prevent ammonia from entering a stream, lake, sewer, or ditch. Any release of this material, during the course of loading, transporting, unloading or temporary storage, must be reported to U.S. DOT as required by 49 CFR 171.15 and 171.16.

SECTION 7: HANDLING AND STORAGE

Refer to the ANSI K61.1 standard for storage and handling information. Protect containers from physical damage and temperatures exceeding 120°F. Use only approved storage systems. Zinc, copper, silver, cadmium, and their alloys must not be used in ammonia systems since they can be rapidly corroded by it. Avoid hydrostatic pressure, which can cause equipment rupture, by adhering to proper filling procedures and the use of hydrostatic pressure relief valves where appropriate.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

RESPIRATORY PROTECTION: Respiratory protection approved by NIOSH / MSHA for ammonia must be used when exposure

SKIN PROTECTION: Rubber gloves and rubber or other types of approved protective clothing should be used to prevent skin contact. A face shield should be used for increased protection from contact with liquid or vapor.
EYE PROTECTION: Chemical splash goggles, approved for use with ammonia, must be worn to prevent eye contact with liquid or vapor. A face shield should be used for increased protection from contact with liquid.
VENTILATION: Local positive pressure and/or exhaust ventilation should be used to reduce vapor concentrations in confined spaces. Ammonia vapor, being lighter than air, can be expected to dissipate to the upper atmosphere. Ammonia concentrations may also be reduced by the use of an appropriate absorbent or reactant material.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT: -28.1°F
SOLUBILITY IN WATER: High
MELTING POINT: -107.9°F
PERCENT VOLATILE BY VOLUME: 100%
VAPOR PRESSURE: 4802.9 mm Hg @ 80°F or 107.6 psia.
SPECIFIC GRAVITY: 0.62 @ 60°F (water=1)
VAPOR DENSITY: 0.60 @ 32°F (Air=1)
pH: Approx. 11.6 for 1 N Soln. in water
APPEARANCE: Colorless, pungent gas

SECTION 10: STABILITY AND REACTIVITY

STABILITY: Material generally considered stable. Heating above ambient temperature causes rapid increase of vapor pressure.
INCOMPATIBILITY (materials to avoid): Ammonia can react violently with strong acids. Under certain conditions, ammonia reacts with bromine, chlorine, fluorine or iodine to form compounds, which explode spontaneously. Reactions of ammonia with gold, silver or mercury to form explosive fulminate-like compounds has been reported.
HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen on heating to over 850°F. The decomposition temperature may be lowered to 575°F by contact with certain metals such as iron or nickel.
HAZARDOUS POLYMERIZATION: Will not occur CONDITIONS TO AVOID: Not applicable

SECTION 11: TOXICOLOGICAL INFORMATION

Ammonia is a strong alkali and readily damages all body tissues. Ammonia is not a cumulative metabolic poison.
Carcinogenicity, Reproductive, Mutagenicity, Teratogenicity Effects: No information is available and no adverse effects are anticipated.
Synergistic Materials: None known.

SECTION 12: ECOLOGICAL INFORMATION

AQUATIC TOXICITY: 2.0-2.5 ppm/1–4 days/ goldfish and yellow perch/LC; 60-80 ppm/3 days/crayfish/LC_{100}; 8.2ppm/96hr/fathead minnow/TLm
WATERFOWL TOXICITY: 120 ppm
BIOCHEMICAL OXYGEN DEMAND: Not pertinent
FOOD CHAIN CONCENTRATION POTENTIAL: None

SECTION 13: DISPOSAL CONSIDERATIONS

Recover ammonia if feasible. Otherwise, let ammonia evaporate if appropriate. Only personnel experienced in ammonia spills should add water to liquid ammonia. Dispose of diluted ammonia as a fertilizer or in an industrial process. For Hazardous Waste Regulations call (800) 424-9346, the RCRA Hotline.

SECTION 14: TRANSPORT INFORMATION

	DOMESTIC SHIPMENTS	INTERNATIONAL SHIPMENTS	CANADIAN TDG ACT
Proper shipping name:	Ammonia, Anhydrous	Ammonia, Anhydrous	Ammonia, Anhydrous
Shipping Class:	DOT 2.2 (nonflammable gas)	2.3 (poison gas)	2.4 (9.2)
Identification Number:	UN1005	UN1005	UN1005
Packing Group:	None	None	None

SECTION 15: REGULATORY INFORMATION

NOTICE: This product is subject to the reporting requirements of SARA (1986, Section 313 of Title III) and 40 CFR Part 370.
CERCLA/SUPERFUND, 40 CFR 117.302: Unpermitted releases of 100 lb. or more of ammonia in any 24-hour period must be reported immediately to the NRC at 1-800-424-8802, the SERC, and the LEPC. Written follow-up is required to SERC & LEPC.
OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200: Ammonia is considered a hazardous chemical.
TOXIC SUBSTANCE CONTROL ACT: This material is listed in the TSCA Inventory.
EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (SARA, TITLE III): Section 302 Extremely Hazardous Substance: Yes; Section 311/312 Hazardous Categories: Immediate (Acute) Health Hazards; Section 313 Toxic Chemical: Yes
WHMIS: One percent (1%) CALIFORNIA PROPOSITION 65: Reproductive: No Carcinogen: No
OSHA PROCESS SAFETY MANAGEMENT, 29 CFR 1910.119: This product is subject to the Process Safety Management requirements of 29 CFR 1910.119 if maintained on-site in quantities of 10,000 lb. or greater.
EPA CHEMICAL ACCIDENTAL RELEASE PREVENTION, 40 CFR PART 68: This product is subject to the Risk Management Plan requirements of 40 CFR Part 68 if maintained on-site in quantities of 10,000 lb. or greater.
DRINKING WATER: Maximum use dosage in potable water is 5mg/l.

SECTION 16: OTHER INFORMATION

REASON FOR REVISION: 1. Addition of new Toll Free Customer Service Number in Section 1.
2. Revised LEL and UEL from 16-25% to 15-28%. 3. Company name change from LaRoche Industries to Airgas Specialty Products.
4. Canadian transportation emergency information added. 5. California PEL limits added.

Technology of the Process

- A block flow diagram or simplified process flow diagram? [68.65(c)(1)(i)]
- Process chemistry? [68.65(c)(1)(ii)]
- Maximum intended inventory? [68.65(c)(1)(iii)]
- Safe upper and lower limits for such items as temperatures, pressures, flows, or compositions? [68.65(c)(1)(iv)]
- An evaluation of the consequences of deviation? [68.65(c)(1)(iv)]

Equipment and Design

- Materials of construction? 68.65(d)(1)(i)]
- Piping and instrumentation diagrams [68.65(d)(1)(ii)]
- Electrical classification? [68.65(d)(1)(iii)]
- Relief system design and design basis? [68.65(d)(1)(iv)]
- Ventilation system design? [68.65(d)(1)(v)]
- Design codes and standards employed? [68.65(d)(1)(vi)]
- Material and energy balances for processes built after June 21, 1999? [68.65(d)(1)(vii)]
- Safety systems [68.65(d)(1)(viii)]

Safety System

Design and Engineering

- Documented that equipment complies with recognized and generally accepted good engineering practices? [68.65(d)(2)]
- Determined and documented that existing equipment, designed and constructed in accordance with codes, standards, or practices that are no longer in general use, is designed, maintained, inspected, tested, and operating in a safe manner? [68.65(d)(3)]